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BRITISH SHEEP IN THEIR NATIVE HOMES

By C. S. Plumb

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THERE are wide extremes in the conditions under which sheep are bred and developed in England and Scotland, but not in the policies of the British flockmasters. No matter whether on the high hills, the rolling uplands or the lowlands of the Midland counties, the flockmaster puts a premium on a fixed policy of breeding, which involves retaining the best ewes for the flock, headed by rams of distinctly high merit. The uniformity and general excellence of British flocks, is a revelation to the American student of sheep husbandry.

Associated with more or less travels about in England and Scotland among the flocks of the country, there remains sharply fixed in my memory, certain days and experiences that I would refer to here, as affording striking and widely different examples under which sheep are developed on the other side of the water.

On a beautiful day in June, I took train from Tweedmouth, to go back into the border country and see the Cheviot sheep on his native heath. The railway followed along through the valley of the turbulent Jed up to the old town of Jedburgh back among the hills, with the brawling stream cutting the town in two. The scenery the entire distance is very picturesque and old castles and ruins show this to be a most historic country. As one approaches Kelso, sheep grow more and more common, and increase in number up to Jedburgh where they become very abundant. The old town lies down in the valley, with high grassy hills on every side. From the hill tops above the town, in every direction one sees flocks of sheep. No locality is spared. Even the town park has a considerable flock grazing on the rich sward. It is a most unusual sight, flocks of sheep everywhere, the farms devoted to them. The Mayor of the town, Mr. Swords, took us about and with him we visited flocks near at hand, where he showed us cross bred Cheviots, such as the border country is famous for, the result of breeding Border Leicester rams on Cheviot draft ewes. A draft ewe in Great Britain, is usually an old or perhaps undesirable ewe, taken from the pure bred flock and sent to market or used for well defined cross-breeding for furnishing mutton. "Cheviot half breeds" as produced in the border country, are much in demand on account of their sweet, high-class, not over-fat mutton. On this trip, I saw a number of black sheep, one of which I was assured was a pure bred Cheviot ewe.

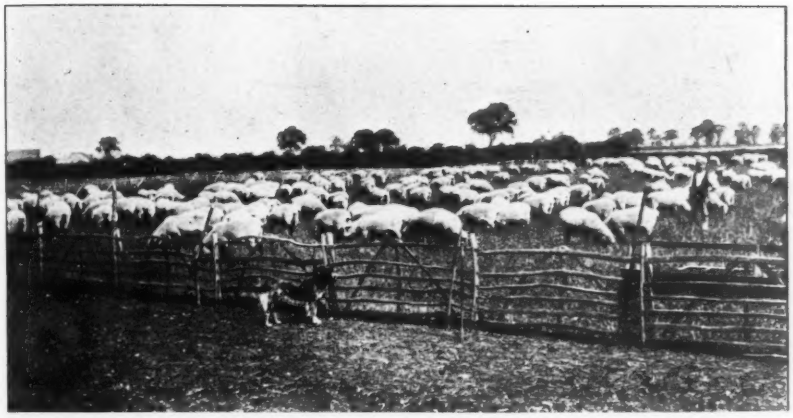
Back in the mountains, some 15 miles from Jedburgh, one finds himself in the very heart of the Cheviot country, a region composed of magnificent, grass covered hills, rising to a height of over 3000 feet, of which "The Cheviot" is the greatest elevation. One sees nothing here but

A PEN OF ROYAL SHOW WINNERS ON FARM OF T. BIRVER JONES
NEAR SHREWSBURY, ENG.
Photo by C. S. Plumb.

these beautiful, everlasting hills, and grass and sheep. There are no trees, excepting here and there about a farm-steading and along by the few stone walls. No fences are to be seen. Sheep wander aimlessly about, singly and in pairs, everywhere. The Cheviot lacks the flocking habit, and so each sheep drifts off by itself as an independent individual. It is a most unique sight to a Yankee.

Grass is the main food of the sheep in the Cheviots. Near the barns are some small fields of roots or oats or barley, grown for a few of the more favored animals for show or special feeding, but the main flock is entirely pasture fed the year through, unless in winter the snow gets too deep, when hay has to be fed in a limited way. Men count their sheep by thousands, and having but small barns, few of the sheep ever see any other covering than the canopy of heaven. Back in these hills are found John Elliott, Smith of Mowhaugh, George Douglass and the men who are making Cheviot history today. These men have beautiful homes with the conveniences of modern life, and their hospitality is of the sort that one must always appreciate and long for yet more.

On another occasion I took train from London and ran up to a little station not far from the great University town of Cambridge. My objective point was Babraham, the old home of the famous Jonas Webb, that great constructive breeder who did so much in the first half of the last century to make the Southdown sheep unsurpassed as a mutton producer. The Ellmans in South England in the Southdown hills had done much to give great fame to this breed, when Mr. Webb up near Cambridge took up the work where they left off. He retained all of the famous early maturing, superior fleshing quality of the breed, but at the same time bred into his flock more size and constitution and made the Southdown a better sheep. He began his work about 1821, and became one of the few really great constructive breeders of sheep in English history. He let his rams out for large sums of money, and his sheep were famous all over Great Britain and Europe. Though the flock was dispersed in 1862, Southdowns have been continuously bred there ever since. Babraham is a typical English estate of fine, slightly rolling pastures, a century or more old, dotted with



420 OXFORD DOWN EWES IN FIELD OF RAPE ON FARM OF GEORGE ADAMS, FARRINGTON, ENGLAND
Photo by C. S. Plumb

great oaks and elms. Mr. F. N. Webb, a grandson of Jonas, is manager of the estate, which belongs to C. Adeane, Esq., and here I saw what undoubtedly is the finest flock of Southdown or any other kind of sheep today in existence. No other flock compares with that of Babraham for prizes won at English shows, or for influence in the breeding of other flocks. As is done elsewhere in England, roots are extensively used, and in summer, besides pasturage, as fall comes on, the sheep are turned on sainfoin or rape, or in late fall and winter on turnips in the fields. Considerable grain is grown about Babraham, and while in the Cheviots cultivated fields are rare, here they are very common. The Southdowns are most carefully separated according to age and sex. The stud rams used in the flock are of the very choicest sort, both in conformation and breeding. They are not for sale at any price. After a time, some of their very best rams may be priced, when the estate has used them all that is desirable. Stock rams and ewes for sale, are kept by themselves, while the reserve ewes and lambs are in groups by themselves. I looked over a large flock of reserve ewe lambs, grazing on pasture, but was given to understand that nothing would be priced. The principle of retaining the best to keep up the flock standard, is not deviated from. A large flock in a near by field, however, presented excellent opportunity for a selection of breeding ewes at a very reasonable price. Mr. Webb is one of the prominent English gentlemen farmers, active in Southdown and dairy Shorthorn circles. His home is most hospitable, and as I sat at the table with Mr. Webb and his charming wife and delightful children, I felt that it was well worth while journeying thousands of miles to such a Southdown shrine.

The Cheviot and Southdown are not very big sheep, but down in the south country, in Oxfordshire and Hampshire, one finds the breeds of those names, big, lusty fellows, carrying all the size called for in the bigness so much demanded by American farmers who seek quantity as a first essential.

Faringdon, England, is a little, old fashioned town in Berkshire, yet in the Oxford country. The Crown Hotel is the best one in town, and it is unique among the many quaint old hotels of England. I doubt if any two floors in the place are on the same level, and the building rambles about like the crooked streets of the

A CHARACTERISTIC VIEW IN THE CHEVIOTS NEAR LOWER HINDHOPE, THE FARM OF JOHN ELLIOT. THE WHITE DOTS ON MOUNTAIN SIDE ARE CHEVIOT SHEEP
Photo by C. S. Plumb

old town. But George Adams, Esq., a real, typical English farmer lives here, and as a breeder of Oxford sheep he is well known on this side of the Atlantic. He is now about 60 years old, and no doubt as genial and hospitable, as he was ten years ago when he drove me over his 4,300 acres and showed his 1,800 head of breeding ewes. Not only is he a great breeder of sheep, but he is a great farmer, with 500 milking Shorthorns and 60 Shire brood mares, and hundreds of acres of land under cultivation. It is a beautiful rolling country, and the river Thames lazily drifts near by here on its way to London. The region is fairly well wooded, and the pastures have abundant shade from oaks and elms. Wheat is very extensively grown, and also oats and barley. Mr. Adams grows large areas of mangolds for his sheep. During the late summer and fall, under the control of extensive hurdles, he keeps a large number of sheep on pasture crops of the rape and kale sort. While the stables on the place are fairly extensive, he cannot handle all his stock conveniently under roof on one farm. These big Oxford Downs are given plenty of grass in summer, and roots in winter but they are not fed much grain. They are kept under close restriction as to range. As I saw the sheep grazing behind the hurdles, I did not wonder that the people of the Mississippi Valley looked with favor on this big, heavy shearing sheep, that could consume corn to great advantage. The Oxford country reminds one of some of the less rugged parts of New York, not far from Ithaca. The beautiful shade trees in some ways reminded me of New England, but the town of Faringdon, Never! That mayhap, is as unchanged as it was when the Pilgrim Fathers landed. But George Adams, may his shadow never grow less, must also be placed in that galaxy of British flockmasters who are real souls of hospitality and who are not likely to be outshone in that respect, even by the men of Kentucky.

It would seem a shame to leave this subject without a word about the Shropshire and his home among the hills and valleys of Western England, Shrewsbury is the home center of the Shropshire, and here Alfred Mansell, Esq., holds forth as the Secretary of the English Shropshire Flock book, and as a prime promoter of this great rent-paying mutton breed. Shropshire is a country of richly grassed hills with many flocks grazing on the pastures or on the rape or roots. Beautiful pastures are here, and the breed that grazes upon them has no superior for present day popularity. The best breeders select their stock with much care, and retain them for home use. The choicest rams do not leave England. They are seen in the stud and at the Royal and other shows. The Shropshire is not in general a high priced sheep in England, and I attended a sale at Mr. Fenn's with Mr. Mansell, and the prices ruled very satisfactory. Many excellent sheep changed hands at around $30 to $50.

It is a rich experience, following in the pathway of the goldenhoof, from up in the highlands, down into the lowlands, amid flocks widely different in character and inheritance, yet each with its significant lesson. For me, the greatest thing taught by my British cousin, is that of definiteness of purpose linked with high ideals in breeding. That is a lesson that we on this side, need to have presented to us from such various points of view that its significance and value may be thoroughly appreciated. Among the various ways that this lesson may be taught, none very naturally will be quite comparable with a trip of observation itself among these great British flocks, that have done and are now doing so much for those of America.

SWINE FEEDING

By William Dietrich

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SWINE feeding is somewhat comparable to the building of a brick house. In order to do this given amounts of different kinds of material is necessary. Thus it is in feeding. The animal body must be constructed, which requires various kinds of material and different amounts of each. Furthermore, after the body is once made it must be maintained. In the structure of the animal body various kinds of material are necessary as follows: mineral matter, protein, carbohydrate, fat, water and oxygen. In order then to feed the hog properly it is necessary to get into the structure the proper amounts of these different kinds of substances. But in the construction of the animal body it is somewhat different from the house inasmuch as the animal body does its own work and seems to be influenced in this to a considerable extent by previous generations. Thus, in order to feed a hog successfully it seems as if it is necessary that ancestors should be properly fed for several generations before it is born.

Mineral matter is supplied in varying quantities by different feeds and in different localities but many times ingredients of this nature are not present in large enough amounts. To supply whatever deficiency there may be it is suggested that pigs be given free access to such mineral substances as salt, charcoal, ground limestone, bone meal and hard wood ashes. If these are set into the pen in separate compartments of the trough the hogs can help themselves to whichever one or to all, as their needs demand. Perhaps some day somebody will have the ability, the time, the patience and the funds to work

out just how much of these various kinds of mineral matter hogs need under different conditions.

In regard to protein it has been shown that pigs have the ability to eat and digest considerably more than can be used by way of building this up into body tissue. This being true the pig is stunted when too much is fed so that it will not do as well thereafter. Considerable time has been spent at the Illinois Experiment Station to determine the amount of protein that will produce the best results. For market pigs during the growing period this ranges between .6 and .7 pound digestible crude protein per day, per hundred pounds live weight. For pigs that are being developed for breeding purposes the amount should be less. During the fattening period market pigs also can get along to better advantage with considerably less. On account of limited time and space full discussion of these matters can not be given but the reader is referred to the writer's publications.

Carbohydrate and fat although they serve the same purposes in the body after being digested and absorbed should each be fed in certain definite quantities to produce the best results. They are handled by different processes in digestion and absorption.

The amount of water that a pig requires for best and most economical development also resolves itself to the same basis as the other nutrients, viz., in order to get the best results pigs should be fed a certain definite quantity of water. This also varies as between market pigs and breeding pigs. Furthermore, in the cooler climates the pig ordinarily will not drink enough water in winter, consequently for good results they must be fed water along with the other feeds and probably the best way to do this is to feed it in the form of a slop so as to make it palatable and also to induce them to drink it. Then again, during the hot days of summer there is a possibility that pigs will drink too much water. This also has its harmful effects.

Oxygen is probably the most important constituent of the ration. To emphasize this fact it need only be mentioned that if the oxygen supply is cut off the animal will die in a very few minutes. It can get along without water for a few days and can maintain itself without dry feed for several weeks. Oxygen is necessary in many of the processes of metabolism and in order to insure a sufficient supply at all times, pigs, and especially growing pigs, should be given an abundance of exercise.

In order to summarize the question of swine feeding they should be born from ancestors that have been properly fed and handled and then be fed proper amounts of water, protein, mineral matter, carbohydrate and ether extract and be given an abundance of exercise. Then pigs will develop as they should and return profit to their owner.

RAIN WITHOUT CLOUDS

By R. R. Keely

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THE writer was engaged in British Columbia in the summers of 1907 and 1908, in the development of irrigation systems. The shortage of water in some sections of that country led him to investigate the subject of loss of water. In his investigations he became associated with Mr. Clement Vacher, of Kelowna, B. C., a French prospector, farmer and scientist, who had given this subject considerable study. In taking up the study of economy of water in irrigation, we were led to an investigation of the methods in use.

In general, there are two methods which may be used for artificially watering growing crops.

(a) Water is carried over the land in open ditches or furrows between the rows of growing crops, or beside the rows of trees in an orchard.

(b) Sprinkling the water over the ground with a garden hose, or other similar methods, which, in general, are too slow and expensive to be of commercial value.

(1) In the first case, the waste of water is excessive, due to evaporation and seepage. The water is usually carried in open ditches where much of it evaporates or soaks away where it is not needed.

(2) Most crops yielding a high profit require good drainage and a rather sandy, or open soil. By exhaustive experiments in actual irrigation by the ditch method, we found that the conditions in general were as shown in Fig. 1, where the wetted soil is shown by the total shaded area, while only the top sixteen or eighteen inches is useful to the growing crops, as shown by Fig. 1. The shaded area below, or about 82 per cent. of the water is wasted.

(3) In orchard irrigation in a dry climate, the water must flow through the rows continuously for several hours or days. During this time the area of damp soil is exposed directly to the hot sun. The result is an enormous waste of water due to evaporation. The water fills the pores of the soil, keeping off the supply of oxygen which comes from the air.

(4) Since the water is in open channels, it must flow by gravity, requiring in many cases, expense in bringing the water to the highest point of the land, grading the land to get an even distribution of water and building elevated flumes to carry the water over depressions.

(5) There is considerable cost of labor in plowing open the furrows and in constant attention required in distributing the water during irrigation. The labor is required at busy seasons of the year when help is hard to get.

(6) The open flumes and ditches are subject to rapid deterioration, making necessary a large annual cost of maintenance.

(7) In open flumes the water becomes unfit for domestic use and, in general, it must be pumped into the building for such use.

Case (b) need not be considered here, as the rate of applying the water is too slow and the labor cost too high for practical application.

With the conditions as stated above, the problem has been to design a system which established a decided improvement. The conditions as shown in Fig. 1 were determined by experiment. A study of these results brought out the possibilities of improvement. With the system about to be described, an effort is made to imitate nature, that is, to sprinkle the water on the surface of the ground in a way similar to that of natural rain. To do this nozzles were designed so as to:

(a) Throw the water high into the air, allowing it to come down as rain or a fine mist.

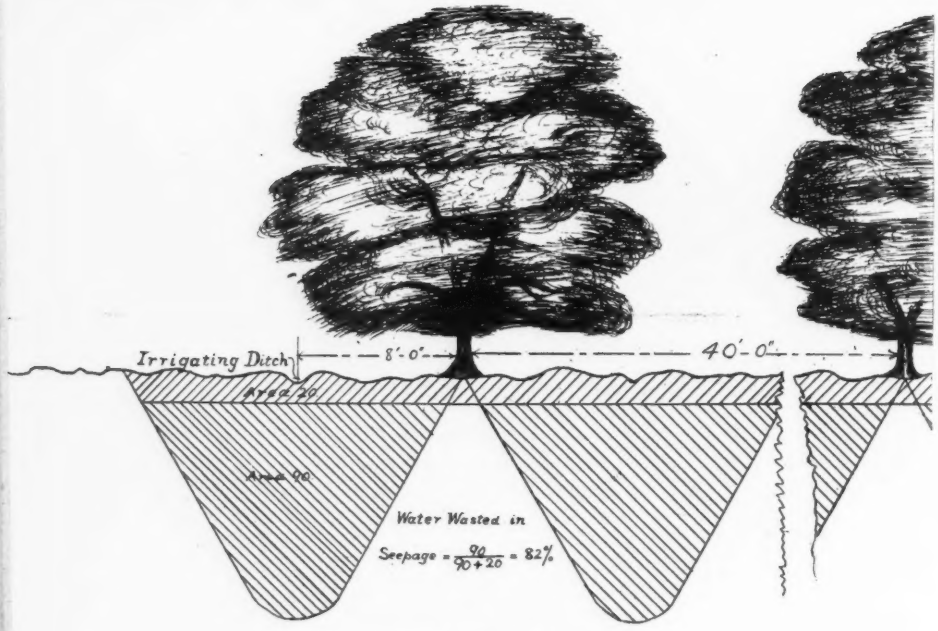


Fig. 1.

(b) To project the water over a great distance, so as to cover as large an area as possible with each unit, thus reducing the amount of piping and the number of units.

(c) Even distribution of the water over the area irrigated.

With this system the water is brought to the point of use in pipes instead of in open ditches, as by the other method. This water is maintained under pressure and is sprinkled over the surface of the ground by means of nozzles.

THE FIRST STEP in the development is shown in Fig. 2, which consists of two nozzles mounted on a revolving head, similar to a lawn sprinkler, throwing water for a small distance and distributing it evenly over this area.

The SECOND STEP was the development of a nozzle which would throw the water to an exceedingly great distance and properly distribute it over an annular ring at some distance from the center. With this nozzle it was found impracticable to irrigate the space near the unit, so with these two nozzles the THIRD STEP was obvious, that is, to take one nozzle from Fig. 2, and one from Fig. 3, getting the result shown in Fig. 4. Each nozzle is adjustable so as to get any distribution of water desired for the area covered, and the distribution is entirely under the control of the operator.

THE PRACTICAL RESULT is shown very nicely in Fig. 5, which is a photographic reproduction of one of the nozzles in operation in the famous Okanagan Fruit Growing Section of British Columbia. The photo shows, by comparison with familiar objects, how the water is thrown to a great distance and the beautiful way in which it is atomized and distributed,

falling to the ground gently in the form of fine drops or mist.

Water is supplied under pressure in pipes, usually laid beneath the surface of the ground. The source may be from city mains, from high ground or near-by mountains by gravity, or by gasoline or electric motor driven pump. It is found for small areas that from ½ to 1 Horse Power in engine and pump capacity will generally be required per acre, depending on the annual rain fall, the character of the crops and the nature of the soil. In this case, it would be necessary to use the pump only one-half the time, or less, during the dry season. By careful management and care in keeping the pump running continuously, a smaller size of pump may be sufficient when irrigating large areas.

The pipes may be of either wrought iron, ordinary cast iron water pipe, or wood stave pipe, as used extensively on the Pacific Coast. They are usually laid beneath the surface, out of the way of cultivation and beneath the action of the plow, where they are protected from rapid deterioration.

The size of pipe varies with the conditions. If it is a gravity system with plenty of pressure, the pipe can be small, but with a pumping plant the pipes should be fairly large so that the loss of head in friction will be small, for this friction loss represents power consumed.

The cost of the system may run as high as $50.00 to $100.00 per acre installed. In many cases the pressure can be supplied by gravity. Where gravity system is not available, the cost of pump must be added to the above.

One of the great points in favor of the system is the saving in water. It has been determined, in the three years in which this system has been in use, that from 60 to 80 per cent. of the water can be saved.

The labor problem is almost entirely eliminated, and when it is considered that there is great difficulty in getting good men in the busy season, this is an important point.

All pipes being laid under the surface of the ground, the field is free for cultivation and the cost of maintenance is practically eliminated, for it is well known that pipes properly laid under ground will last many years. In uneven ground, there is the difficulty with the ditch system in distributing the water evenly over the surface. If it does not have constant attention, it is liable to wash out portions of the field and growing crops, but with the sprinkling system, the water is put on like rain and there is no tendency to wash the surface of the ground. There is no leveling of the ground, for the water is sprinkled on evenly regardless of the character of the surface.

Any system that puts water on the surface until it becomes shiny will be found injurious, baking the land and causing it to become encrusted, sometimes pinching off the young growing plants. It also stops the flow of air and oxygen to the roots. When the land is packed, the moisture is drawn to the surface by capillary attraction and the evaporation by the sun's heat is rapid. Any system where the nozzle does not rotate, and the water flows continuously for a time, will thus pack the land and is objectionable.

One of the advantages of our system is that by the slow rotation, (requiring about one minute), the water has time to soak into the ground and the surface becomes filled with oxygen before another application comes. Then as another application comes, the oxygen is carried into the soil and roots. The water, in passing through the nozzles into the air, is thoroughly aerated and warmed and carries into the ground much oxygen. The value of these points cannot be over-estimated.

Under favorable conditions, one unit will irrigate an acre of ground, and in general, not more than four or six units will be required in any case. Then it is seen that the amount of piping is reduced to a minimum.

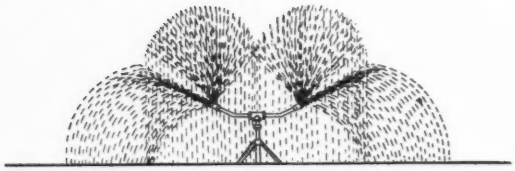


Fig. 2.

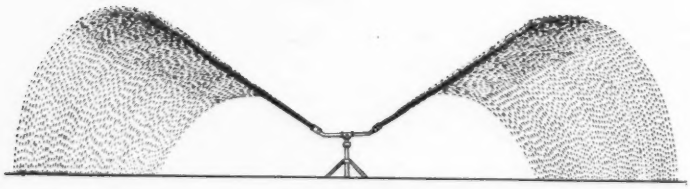


Fig. 3.

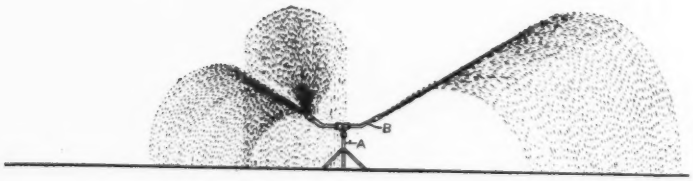


Fig. 4.

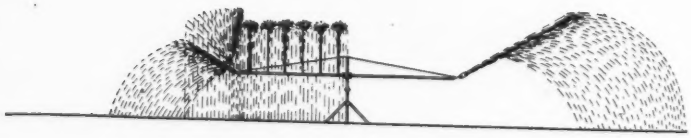


Fig. 8.

The strong points in connection with this sprinkling system are:

(1) Economy of water, every drop being put where it will do the most good, and in just the required quantity, eliminating seepage and reducing the evaporation. Sixty to eighty per cent. of water is saved.

(2) Economy of labor. It is only necessary to open a valve, turning on the unit when it is desired to irrigate, no matter whether the ground is level, hillside, or rolling.

(3) Minimum cost of maintenance. After the pipes are laid, they are good for many years.

(4) All pipes are under ground, thus leaving the surface free for cultivation.

(5) No leveling or grading of the surface is required as the water is as evenly distributed over uneven ground as over level.

(6) The water under pressure is suitable for domestic supply.

(7) In many cases a spraying solution can be put into the pumps, so as to spray the entire crop at a minimum cost.

(8) The ground is not packed, but is made mellow by the gentle fall of fine rain.

(9) Every plant gets the same amount of water.

(10) This system is the nearest to nature of any way of watering.

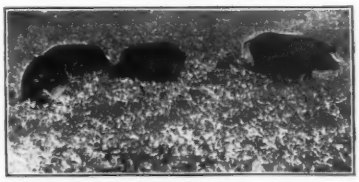
(11) No attention is required while irrigating and the attendant cdn ao other work.

(12) There is no washing of the soil, as no streams of water run on the surface of the ground.

(13) The system is suited to any pressure, from 2 to 150 pounds per square inch.

In Fig. 8, we used longer arms with the revolving head so that a larger area per unit could be covered in proportion to the additional length of the arms.

The System has been in use in British Columbia and in France for the past three years and has given excellent results. For the dry sections of the Pacific Coast, and for irrigating truck gardens in the neighborhood of large cities, it is believed that the system will be of value.



SOME PRINCIPLES OF VETERINARY HYGIENE AND THEIR RELATION TO THE HEALTH OF SHEEP AND SWINE

By D. H. Udall

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SHEEP and swine are governed by the same laws of health as other domestic animals and man. As in all animals a normal healthy condition and progressive development are controlled by external surroundings or environment. Unthriftiness, arrested development, or disease reach them from without. They are never the victims of their own vicious habits; their development and health are impaired or promoted in proportion to the ignorance or knowledge of their owners.

There are three groups of influences that exert a profound effect upon the development and health of animals; namely, atmospheric conditions, food, and parasitic infection by animal or plant organisms. Prolonged slight variations, or transient marked variations in any of these influences endanger the health of the individual. Normal progressive growth rests upon the support of certain definite, constant, and unchanging natural laws or conditions.

Pettenkofer, who recognized and described the effect upon animals of variations in atmospheric conditions, and who recognized the principles of scientific feeding, was the real "Father of Hygiene".

Much importance is attached to this feature of hygiene because faulty atmospheric conditions are frequent causes of arrested development or disease without being recognized by the owner or expert adviser. From a standpoint of health the atmosphere must be considered with reference to its *chemical composition*, *moisture*, *temperature*, and *light*.

The atmosphere supplies *oxygen* to the animal and receives in return various gases that are more or less harmful when present in the air in excess. Similar gases also enter the air from decomposing animal secretions, such as manure and urine. In many pig pens the manure heap is the chief source of air contamination. Whether the animal is a sheep, a pig, or a man, the effect of such contamination on the development and health is the same. Natural laws are impartial. The first, and often the principal effect of such contamination, is to depress the spirits and lower the tone of the animal. In some cases it has been observed that such animals tend to fatten at the cost of production or growth. Air vitiation beyond a certain point, however, affects the appetite to such an extent that, not only is development arrested, but there is a loss of weight. The air of the typical pig pen is subject to more rapid vitiation than most places in which domestic animals are kept, the chief source of contamination being the manure heap. Animal excretions become sewage, and decomposing sewage can in no way promote physiological development. Since pigs excrete relatively more water in the form of urine than sheep, decomposition of the litter proceeds faster. Sheep excrete only about thirty per cent. of their moisture through the kidneys, swine about seventy per cent. From this it will be seen that pig pens require more litter and more frequent cleaning than do those of other domestic animals.

The *moisture* and *temperature* of the atmosphere have a marked effect on the comfort and health of animals. When the atmosphere is so saturated with vapor that it forms in drops on the walls the per cent of moisture is 100. With a temperature of 60 to 65 F. a moisture per cent. of 40 to 70 is desirable. When the temperature is below 60 degrees F. an increase in

the moisture of the air increases the loss of the body heat; when the temperature is above 60 degrees F. an increase in the moisture of the air retards heat radiation from the body. In the winter many stables have a moisture per cent of 90 to 100. Pig pens are very liable to be saturated with moisture owing to a moist diet, the high per cent. of moisture excreted in the form of urine, the tendency to keep pigs in manure cellars, and the custom of constructing pens with cement or other cold materials on the surfaces of which moisture is condensed. The hygienic effect of exposure to a cold, damp atmosphere is to increase the loss of body heat and thus cause chilling. The mucous membranes finally become congested, the resistance lowered, and this may finally lead to actual disease. Prolonged exposure to such influences must at least restrict the development. Sheep are less liable to suffer from the ill effects of damp, cold stables because of the common custom of turning them out during the day. They are, however, no less susceptible to the ill effects of cold and moisture than other animals, especially when such atmosphere is combined with vitiated air. Foundations resting upon poorly drained soils are transmitters of moisture unless constructed so as to overcome this defect. Since both sheep and swine are frequently housed on ground or basement floors this source of dampness and cold is a very frequent cause of arrested development, and disease. Some of our most troublesome outbreaks of chronic pneumonia in pigs are considered by excellent authorities to be due to housing in pens that are not easily kept dry. A combination of high temperature and moisture is a frequent cause of heat-stroke in sheep and swine during transportation. Otherwise it is of slight hygienic importance. Dry atmosphere, either hot or cold, rarely impairs the comfort or health of domestic animals in this climate.

Pigs and sheep require as much *light* as do other domestic animals; a window space equal to one twelfth to one fifteenth of the floor space.

In the foregoing lines I have attempted to briefly mention those features of the atmosphere that have a direct bearing on the comfort and health of animals. In the following lines an attempt is made to indicate the methods by which sheep and swine in particular may enjoy the beneficial and essential parts of the atmosphere without being subject to those extremes which are so often the unrecognized but fundamental causes of failure and disappointment.

From a hygienic standpoint it is essential that the *foundation and walls* should be impermeable to water. Porus material absorbs water from below and from the sides; through capillary attraction dampness may spread to distant parts and become a constant source of moisture for an entire stable. Hard baked tile or cement, form efficient barriers against soil moisture. In addition a layer of tarred paper or one-third to one-half inch of asphalt may be placed in the foundation cement, while a layer of asphalt tar may be spread over the outside of the foundation wall.

In the construction of the walls above the foundation one must provide for the exclusion of moisture, and the retention of heat. They must, like the foundation, be impermeable to moisture from without, and in addition they must be warm and dry. External moisture is excluded by a covering of waterproof material. For ordinary construction this is most readily accomplished with paint. A wall that is a poor conductor of heat is easily warmed and kept warm. Moist stable air coming in contact with it will retain as vapor a relatively high per cent. of its moisture. Condensation of moisture, or "sweating" of the walls is restricted. Such a wall must be built of porous material like wood, or paper. The more compact materials

are warm in proportion to their porosity (soft sand stone, soft baked tile). An air space within the walls is generally believed to act as a non-conductor of heat and cold. According to the results of recent experiments, however, its efficiency has been overestimated. The same space occupied by a very porous material (dry sand, cork refuse) has a much greater heat-absorbing capacity. Exposed walls and partitions of massive tight construction, made of hard materials like stone, cement, or brick are a constant source of cold and dampness in winter.

Control of the air supply, the moisture, and the temperature of stables in which animals are kept is maintained by an artificial system of *ventilation*. The term natural ventilation applies to the exchange of atmospheric and stable air through the pores of the walls. When the walls are properly constructed this exchange is of no practical value. Artificial ventilation must provide for an abundance of fresh air; the intakes and exits must be so constructed that all the parts of the room are aerated; the system must be so controlled that it meets these requirements under all atmospheric conditions. Wide separation of the intakes and exits insures thorough aeration. A relatively large number of intakes and exits prevent drafts. We should not depend on open doors and windows for ventilation. The forces that maintain an exchange between the atmospheric, or pure air, are two: 1. The wind, and 2. Difference between the atmospheric temperature and the stable temperature. The air currents may be forced in a horizontal or vertical direction, giving a horizontal or vertical system of ventilation. The latter is often referred to as the "King System".

The *horizontal system* in its simplest form consists in open doors or windows on opposite sides of the stable or pen. A common and efficient form of the horizontal system consists of frames covered with muslin or cheesecloth. These usually occupy the window space. The advantages of this system are: cheapness, simplicity of construction and operation. The disadvantages are: the cloth must be frequently renewed, when filled with dirt or sleet it is not permeable to air. Its efficiency depends almost entirely on the wind, so that it is not very active on quiet days.

The *vertical system* is constructed of two sets of shafts. One or more exit shafts leading from the ceiling straight up through the roof and above the ridgepole. Another set of shafts passing up in the walls to convey air into the stable. The vertical *exit shaft* may begin six or eight inches below the ceiling, or it may be brought nearly to the floor (so-called "King System"). The supporters of the King system maintain, that since carbon dioxid is heavier than air it settles in the lower part of the stable and finds more ready exit through a shaft that opens near the floor. It is a well known principle of elementary chemistry that when two gases of unequal weight are brought together they form a mixture of uniform specific gravity. The currents of air normally present in all stables are sufficient to prevent the physical separation of gases according to the specific gravity of each.

Another claim for the lower opening is, that the cold air entering in the upper part of the stable gradually falls displacing the foul air of the lower strata, at the same time acquiring a moderate temperature. The same forces that prevent a separation of the gases of the air according to their weight, prevent any great demarcation along the lines of temperature. The general law, that warm air tends to rise, is another force that prevents the convenient accumulation of warm air around low openings of exits. When the fundamental principles of a vertical system are all observed this type of exit shaft is efficient. The

lifting power, however, must be greater than for a shaft opening into the upper layers of the stable air.

The diameter of the exit shaft must conform to its height; a shaft that projects far above the ceiling may have a greater diameter than one that projects only a short distance. In no case should the diameter be more than 14 inches, and it may be as small as 4 inches. Too great a diameter causes a draft in high winds, and is inactive when the air currents are slow. Large shafts are liable to create drafts; they are not so readily warmed, and for this reason have a tendency to drip water in cold weather. The best means of preventing drafts and at the same time have an active ventilation is to install a relatively large number of exits and intakes. One large exit two or three feet in diameter is entirely inadequate for usual conditions. This is one of the chief causes of failure with the vertical system. A diameter of about 16 square inches per 1000 pounds of animal should be provided.

The top of the shaft should be covered to keep out rain and snow, and the lower end should have a damper that can be closed at will. Wood is an excellent material for construction. Four smooth boards may be nailed together, or still better, construct it with a double layer of boards and heavy building paper between. This adds to the warmth of the shaft, thus preventing the formation of moisture and dripping during cold weather. Any turn in the direction of the shaft lowers its efficiency; it should have a vertical direction. A vertical system of ventilation also depends on a tight building. Open doors or windows, or openings in the ceiling prevent circulation through the artificial shafts.

Intakes 4 to 6 inches in diameter and 10 to 12 feet apart should be placed in the wall on all sides. The outer opening may be near the ground, the intake passing up in the wall and entering in an upward direction near the ceiling. When it is inconvenient to place the shaft in the wall it may be carried up on the inner or outer side. Like the exits, every intake should be provided with a damper that can be closed at will. In this way the air can be regulated according to atmospheric conditions. When the stable becomes too cold, or when the wind is high, some of the openings may be closed.

Floors for sheep and pig pens should be constructed of warm materials with an elevation of at least 10 inches above the ground surface. Since the fluid excretions of sheep are relatively slight and are uniformly distributed they require less bedding than do other animals. The floor may be covered with a six inch layer of dry sand for absorption of fluids that pass through the straw. Firmly packed clay is impermeable to moisture and may serve as a foundation for the sand. The sand should be removed with the manure. Cement floors, when protected wth sand, are well adapted to sheep. They are too cold, however, for pigs unless one is able to take unusual precautions in regard to moisture and litter. The objectionable features of cement for pig pens may be avoided by adding a portable floor of wood to cover a part of the pen. This provides a sleeping floor free from the ill effects of cold. In some countries tile blocks or bricks are being substituted for cement. They are very durable, are not slippery when wet, and are much warmer than cement.

In sheep pens each animal should have a floor space of about 11 square feet. Small pens should have a height of about 11 feet. When 300 or more animals are kept together the height should be from 13 to 15 feet. Ten to eleven feet is the correct height for pig pens.

The proper temperature for sheep pens is 50° to 55° F., increased to 60° to 62° in lambing time. Swine need a temperature of 55° to 60°. Young pigs should be kept somewhat warmer (60° to 62°).

FOOD, CARE, AND MANAGEMENT OF THE BROOD SOW

By H. H. Wing
Professor of Animal Husbandry, Cornell University

NEARLY all farmers in the State of New York keep more or less hogs and many attempt to raise more pork than is required for family use. That the production of pork is not more profitable and is not more extensively carried on, is due, in great measure, to the difficulty that many have in securing large sized litters of pigs and in raising them successfully. This difficulty is more often due to carelessness and inattention than to any other one thing. Since there is always a good market for weanling pigs in the spring, it would seem as though the results likely to come from a little care and attention would be well worth while.

It is a common practice to keep one or two brood sows. These are bred to farrow, usually in late March or in April. Such pigs as are secured and survive are raised to furnish pork the following fall. The sow is often fattened up during the summer after the pigs are weaned and disposed of and one sow from the spring litter is saved to breed the next year. This sow, that fares pretty well while her mates are being fattened for pork, is usually kept by herself in a cold pen, after the rest are slaughtered, and depends for sustenance upon slops from the kitchen, supplemented by two or three ears of corn. She is often not well bedded, while her food, although it may perhaps be sufficient, is not well calculated to her needs. She becomes constipated and by the time she is ready to farrow, her whole system is more or less feverish. It is small wonder that when the pigs are dropped, they come small and weak and few in number, while the young sow is feverish, very easily excitable and often loses the greater part of the litter if she does not actually turn cannibal and eat the whole mess up.

The domestic hog does not mature until about three years of age. A young sow seldom farrows as many pigs at her first litter as she will at succeeding litters. When selected carefully, and well cared for, a sow will continue to produce regularly good sized litters twice a year, often until she is eight or nine years of age. Anyone who expects to raise one or more litters of pigs each spring and fall, should aim to secure such brood sows and it is not a difficult thing to do among any of the important improved breeds, and when such an animal is secured she is as valuable as a cow and should be kept as long as she breeds well and regularly even up to eight or nine years of age.

The brood sow should be selected first for prolificacy, second for suckling qualities and third for care in handling her litter. In respect to this last, she is readily susceptible to training.

In selecting sows that are likely to prove good breeders, from a litter of six or eight gilts one should start with twice as many pigs as he expects to develop into good brood sows so that, those that prove unprolific may be discarded after the first litter is dropped, as the matter of prolificacy can only be determined with certainty after one or two litters have been produced. The pig that is likely to develop into a good brood sow should have at least 12 well developed teats. She should be long of body and stand squarely upon straight limbs. The loins should be strong and full and the body deep, particularly through the heart. She should not be too sluggish, and on the other hand, she should not be easily excitable. If the brood sow is a little over long and rangey or a little coarse in bone, it will do no harm as she can be mated with a boar that has flesh producing

qualities somewhat more finely and fully developed.

A good brood sow should be grown rapidly from the time she is born until she is eight months of age and should then weigh from 200 to 250 pounds in good condition of flesh. If she drops her first litter when she is a year old, she should be bred at eight months and from that time should be carefully and judiciously fed.

Sufficient nutriment must be provided to keep the mother growing and to develop strong, vigorous pigs. The food, however, should not be too concentrated. It must have a large amount of protein and should have a nutritive ratio not wider than one to five and one-half. From available foods, quite a wide variety may be selected. When it is available, there is nothing better than an abundant supply of skimmed milk, supplemented with wheat middlings and perhaps a little corn meal. Use about one pound of the grain to seven or eight of the milk, giving the sow about what she will eat up clean.

When the skimmed milk is not available, mangels make a very good substitute for succulent food and the sow should be well bedded with clover or alfalfa hay of which she will eat all the finer portion.

Failing either milk or roots, silage may even be used to advantage. In case these more bulky foods are used, a slop sholud be made of equal parts of corn meal and wheat middlings, with perhaps 10 per cent oil meal, in addition to the roots, clover, or alfalfa hay. This will make an ideal ration, the object being to keep the animal in good condition of flesh and to avoid any tendency toward constipation and its accompanying feverish condition.

If one or two sows are kept by themselves, attention to gentleness will be well repaid. The feeder or attendant can well afford to go over into the pen with the sows and accustom them to his presence, rubbing them along the back and sides, and teaching them that they have nothing to fear from the presence of man. If this is done, when farrowing time comes, and the young pigs need attention, it will not disturb the sow to have a person enter the pen.

When the pigs are born, the mother may be left by herself so long as she remains quiet. Normal partuition in sows is accompanied by quite a long period of lethargy and normally the dam will remain lying down during the whole time of partuition and for several hours afterward, the little pigs finding their sustenance with little or no help if they are strong and vigorous. But it is necessary on the part of the attendant to see that the pigs do not stray away and become chilled. It is not well to have the sow get up to eat within 12 hours after farrowing and then she should have only a very thin slop and it should be warm if the weather is at all cold As the pigs begin to grow and make demands upon the mother, the feed should be increased but it should not be made too rich and care should be exercised as to the use of very much corn meal. If the feed is too rich, the pigs will scour.

In cases where the sow has a tendency to over-lay the pigs, great help is found by nailing a strip of wood three or four inches wide along the sides of the pen about four inches from the floor. This gives the pigs a chance to escape from the mother if she should lie down with her back toward the partition and catch them under her.

A well selected and well trained brood sow should produce regularly twice a year not less than 8 good pigs in a litter. On this basis, if the pigs are worth $4.00 each in the spring and $2.00 each in the fall, at weaning time, the gross returns from such a sow would be $48.00, which approximates the gross returns from the average dairy cow in the State of New York. Could not several thousand good brood sows replace an equal number of poor cows to the advantage of the owners of both?

FORAGE CROPS FOR SWINE

By H. B. Harpending
Dundee, N. Y.

WE of the East are realizing more and more that we have ideal conditions for the breeding and feeding of swine. Our winters are a bit long and cold; but, with a moderate outlay for comfortable buildings and shelters and the exercise of care that the animals get the right ration and sufficient exercise, they are not much of a hardship.

Precaution should be taken that brood sows do not lie in their nests too much during the winter months as this lack of exercise is the cause of small litters and weak pigs at birth.

The writer owns and is in personal charge of a herd of over five hundred registered Berkshires. Practically all of these are on range the year round. They occupy colony houses which cost about $15.00 each to build and have always proven most satisfactory.

In this latitude (Yates County, N. Y.) rye is about the only winter pasture; and, while there is very little actual food value in the forage from this crop during the winter, its succulence to brood sows heavy with pig is worth much. It induces them to get out about the fields instead of lying in the nests. A record of the avoirdupois added to the bunch of pigs allowed to harvest the matured grain, will convince the most sceptical that thereby the rye crop is more profitable than by harvesting and marketing the grain.

The ground is fitted for rye pasture in August. The grain should be drilled about two bushels to the acre and put in anywhere from August 20th to September 5th. It is better if the grain gets a pretty good start before freezing. The swine should be kept from the lot when the ground is very soft and of course they should be rung.

We utilize rye pasture during the winter for pigs of all ages but it is primarily intended for the brood sows. No matter how closely it is fed down, no harm will come to the crop and the sows will be found on the field looking for a green bite at all hours of the day and many times this winter, we have seen them out at nine and ten o'clock at night. Now, the benefit of this exercise alone to a herd of brood sows heavy with pig, can hardly be overestimated; moreover, the green rye in their ration answers about the same purpose as would roots.

At the customary time to sow clover seed in the spring, we seed the rye pastures with medium red clover, or medium and mammoth, about eight to ten quarts to the acre. If the lot is to be seeded to alfalfa eventually, it is a good plan to add to the clover a bit of alfalfa seed for the purpose of inoculation.

The rye can be pastured (except when the ground is too soft) until it commences to joint. At this stage, remove the pigs to grass or rape pastures until the rye is matured and the straw breaks, then turn the stock in to harvest the crop. It is better to start them gradually, an hour the first day, two hours the second, etc. After three or four days, they may run the field at will. The younger pigs will need a bit of milk or slop in addition.

Gilts, young boars or shoats require no grain in addition to rye pasture and mature animals will become too fat if they have constant access to the field. None of the rye will be wasted. The pigs are good gleaners.

We usually let the field remain in clover for a year, plowing and putting in rye again the following fall. If the field is not seeded to clover, it may be plowed about the middle of August and again sown to rye. Fields so cropped will be found to gain in fertility year by year. We have rye pastures that have been so used for years and they seem to get better and better each succeeding year.

HOG IN RYE PASTURE. A SHAPED COLONY HOUSE IN BACKGROUND

We have always believed rye the most profitable pasture, except possibly alfalfa.

The principal danger with alfalfa is that it may be overstocked. It will not do to depend upon the animals to harvest the crop and expect to have much of a crop for long. Alfalfa should be pastured to about one-third or one-half its capacity and mowed and harvested regularly the same as though it were not being pastured.

A patch of sweet corn goes well with clover or alfalfa pasture. Commence feeding stalks and all as soon as the corn is in milk. Start moderately for a week or so. The danger lies in overfeeding. The corn may be cut and fed on the sod or the corn field may be hurdled off and the corn hogged down. This latter practice is very popular in some sections and is profitable, but a continued wet spell may cause considerable waste and perhaps better results will be obtained by cutting the corn and throwing stalks and all to the hogs in their pasture.

Swine on pasture should be provided with salt and hard wood ashes at all times. See that the supply is constant and where all may have access to it. Swine pasturing in an orchard are apt to gnaw the bark unless supplied with salt.

Rape pasture is profitable and very satisfactory. It can be sown any time after the ground is fit in the spring up to July 15th. It is better to have two or more pieces of rape used in conjunction; and, when one is pastured down, turn in the other, until the first has leaved out again. Rape will furnish seed until December first. Freezing will not harm it, except the pigs should not be permitted to pasture on it while the rape is frozen. An excellent idea is to sow rape in the corn field, about three pounds to the acre, at the last cultivation. The labor is insignificant, it is a small job to broadcast it ahead of the cultivator, and the pasture is considerable after corn is harvested.

Orchard grass and blue grass also afford excellent pastures for swine. If these meadows are topdressed occasionally and harrowed each spring thoroughly both ways with a spike tooth harrow, the results will be surprising. We have pastured three such meadows with swine for some

years. We topdress them every other year, harrow them thoroughly as soon as the ground is dry in spring and about June 20th to July 1st, mow them, setting the machine knives as high as possible.

The swine should be rung to prevent rooting and should be kept off the sod when the ground is soft in the spring.

While oats and peas are frequently recommended as a pasture crop for swine, we have never found them profitable. The grazing season is too short and much of the pea vine is wasted by trampling. Some cut the vines and feed in adjoining yards; but the practice is not to be recommended.

Alfalfa, rye and rape will make good. A far trial will usually induce a continuation of the practice and the result will be readily observed in economical gains and large litters of vigorous pigs at farrowing time.

LANDSCAPE ARCHITECTURE FROM THE STANDPOINT OF THE GRADUATE

By Elizabeth Leonard, '10

A YEAR ago I wrote a short article for the COUNTRYMAN from the standpoint of the undergraduate. I would now like to give my point of view as it is today after a year of office and field work, as a possible aid to those now taking the Rural Art Course. I do not mean to criticize the course as now laid out. However, it is generally admitted that no one has yet succeeded in taking all of the work recommended in the course of study. In the process of elimination let me suggest which electives should be preferred, and when chosen, which part of the work should be emphasized. Even when our time was apparently completely filled, it was possible to put special energy into some particular part of the work without neglecting the rest.

The work falls naturally into the heads of (1) design, (2) plant materals, (3) engineering and construction.

Under *design* come the sub-divisions—rendering (pen and ink and water color) titles, lettering and architectural details. It has rightly been the first aim of the department to instil in our minds the broad principles of planning and design; how to grasp a problem and how to think it out, to consult books and get ideas and then to work them out. I confess to a tendency to fuss too long over the appearance of the work. It is all very well to turn out a nice looking plan but do not sacrifice ideas to appearance. After you get into an office facility in drafting will come with practise. Do not worry about the drawing if you only have ideas.

Watercolor is useful so much as it tends to develop a sense of color for combinations in flower arrangement, rendering in watercolor is not done as much as it was once. The tendency is to the use of pen and ink or at the most a mere suggestion of color. First, because the clients object to paying for showy plans and second because elaborate work seems to be "playing to the gallery". Once or twice a year it may be your privilege to make some high class exhibition renderings—if no one else can do them better—but it is a talent easily dispensed with.

At least one good type of lettering should be thoroughly mastered—more if possible—a draughtsman is known by his lettering. It is a mistake to make too elaborate or conspicuous titles. The simpler the better. Each office has its own uniform type; also there is usually a card index system of numbering and cataloguing the plans.

It would be well to keep a note book of architectural details—if only rough sketches with dimensions shown. Some firms buy their garden-

seats, sundials, fountains, terra cotta, etc., but original designs always give an individual touch to the work.

First and foremost learn design through and through. Later you will be too busy doing mechanical work to develop the creative faculty.

Plant materials falls into the subdivisions of botany, horticulture and the regular work laid out in the course. Although necessary as a foundation, the elementary morphology and plant physiology is not directly useful. The same may be said of some of the advanced courses in identification, unless one is fortunate enough as I was, to be allowed to roam at will regardless of the work planned in the course, and to identify horticultural varieties likely to be needed later. The tree courses in identification are useful—the structure of the different woods—is not of much value. The most conspicuous native shrubs and plants should be learned but it is a mistake to delve deeply into the remote species of such things as grasses or compositae.

Almost the first thing demanded of me was the ability to make herbaceous borders and to plant formal flower gardens. This branch of the work is extremely important. The clients, especially the women, take an immense interest in the flower garden and usually insist on discussing it in detail with you.

In England the garden designer is first a horticulturist, then an architect. There is a tendency in America to neglect the horticultural side for the architectural. It is necessary to know how to grow plants; under what conditions and in what soil they will thrive; how late in the fall or spring they can be planted; which things to protect in winter; whether certain things should be planted in the spring or fall; which flowers are best or cheapest raised from the seed or roots; the season of bloom; how far apart and how deep to plant and whether in sun or shade. These are some of the horticultural problems that confront us.

Not only ornamental trees, shrubs and flowers but fruits and vegetables should be learned as well.

Your knowledge of Plant Pathology and Economic Entomology comes into play when the State Inspector comes around and reprimands you none too gently for planting "scaley" apple trees—or if the brown tail moth—the entire shipment must be burned.

Engineering and construction. The ability to make an accurate boundary survey, locating all grades, trees and buildings is not an essential. In such a case you hire an engineer. But if you know how to set up the instrument and take levels, or take a paced and measured survey you can often save the expense of an elaborate survey. I know of one place where the people needlessly paid $200 for a survey when a little common sense would have prevented it.

A last word about the ability to meet clients. This is important. It is very well to be full of ideas—to have dreams of beauty half expressed. It is another thing to make your client see them too. Not only do you have to impress upon his mind your own ideas but you have to wipe out all the preconceived notions which have been gathering in his brain for months. The world takes you at your own valuation. An air of confidence and an assumption of knowledge in the right place will do wonders, provided you are careful to back it up as soon as possible with solid work and real knowledge. When you find that you have to live up to your employer's opinion of you, you can do it if it entails hours of special study. The first few years of office work should be regarded as years of further preparation, constant study and an extension of the training begun in college.

The Creed of the Students of the College of Agriculture

1. We believe that we are here primarily to secure an education.
2. We believe in living a well-balanced, symmetrical life.
3. We believe that to develop a well-rounded, vigorous, efficient manhood and womanhood we must be trained harmoniously, mentally, physically, morally, and that in one person there should be found the highest average of scholarship, physical skill and moral courage.
4. We believe that in order to develop symmetrically we must study faithfully, think clearly, play lively, eat heartily and sleep soundly.
5. We believe in inter-college athletics because of its wholesome emulation, mental relaxation, physical development and moral stimulus.
6. We believe that play is to the body what a good laugh is to the mind and a good deed is to the conscience—refreshing and invigorating.
7. We believe that it is no sin to play to win.
8. We believe that it is better to lose honestly than to win dishonestly.
9. We believe that true sportsmanship will recognize and heartily applaud a successful play on the part of an opponent.

10. We believe that the true measure of victory is in the quality of the opponent and fairness of the play, rather than the size of the score.

11. We believe that all selections and elections to positions of honor or trust within the gift of the students must be made wholly on a basis of individual merit.

12. We believe that efficient service and accomplishment should be suitably rewarded, whether in the realm of scholarship, athletics, journalism, public speaking or other legitimate student activities.

13. We believe that the greatest rewards are to be found not in medals, shingles, diplomas or applause, but in the consciousness of a work well done, a game well played, an honor fairly won, and that we have contributed to the honor and success of others.

14. We believe that every student owes an obligation to himself and herself, and to the college, to do something, while here, for the good of others and for Cornell.

15. We believe that the students of the College of Agriculture should set a standard for wholesome play, right thinking and clean living.

16. We believe that the students in the College of Agriculture subscribe to this creed and strive to live up to it, and that in this they have the hearty co-operation of the College staff.

The Cornell Countryman

MAY, 1911

In Closing

Another year has passed and the 1910–1911 board after this issue transfers the responsibility of publishing THE CORNELL COUNTRYMAN to the shoulders of the new board. We pass from the scene of action and assume whatever position we have earned among the figures of our College history. After a year's experience we feel that it is truly a responsibility which the new board is assuming. We know they will be equal to the task before them. It is our conviction that each year since 1903 has witnessed progress in the development of THE CORNELL COUNTRYMAN. This progress will continue.

The COUNTRYMAN board as elected for 1911–1912 is as follows:

Editor-in-chief, A. H. White, '12; Alumni Notes Editor, E. P. Smith, '12; Artistic Editor, H. E. Coffin,'13; Associate Editors, O. M. Smith, '13, J. S. Brown, '13, D. Alleman, '14, H. C. Stephenson, '14; Business Manager, G. M. Butler, '12; Assistant Business Manager, G. M. Butler, '12; Assistant Business Managers, W. de S. Wilson, '13, B. P. Jones, '13, H. A. Thompson, '13.

We regret very much that because of urgent duties at home, D. G. Woolf, '12, and M. H. McClew, '13, have been obliged to leave the University and thus will be unable to serve on the 1911–1912 board.

It is not without reluctance and some regret that we sever our connections with the COUNTRYMAN. Our labor in managing it and shaping its policies has inseparably bound us to it. Our interest in its welfare will always be sincere and we trust active as well.

Another reason why we dislike to stop is because of the many things we now see which might have been done and the greater things we are confident we could accomplish in the future. We hope the new board will build on our mistakes.

At this the last opportunity of talking through the editorial columns of THE COUNTRYMAN, the 1910–1911 board wishes to express its gratitude to everyone who has helped them produce the COUNTRYMAN. We extend this little word of appreciation to all the contributors, advertisers and subscribers; to all who offered suggestions and well meant criticisms, and to those who extended kindly words of congratulation and encouragement.

In the last chapter of our work we wish to emphasize what we have so often pleaded for—closer relations between the board of the CORNELL COUNTRYMAN and the whole student body, more active interest and more substantial support.

An Announcement

It has been the custom of the CORNELL COUNTRYMAN to publish in it's June issue the photographs, with write ups, of all the candidates for degrees in the College of Agriculture.

This is extremely expensive for us and after all is largely a repetition of the Senior Class Book. The senior classes of the past have never been willing to help out the expense by purchasing the halftones of their photographs from us at cost, we have no reason to assume that the present class would do differently. In view of these considerations the COUNTRYMAN will not make senior writeups a feature of the June issue.

A Commendable Act

Dr. A. S. Alexander the veterinarian of the Wisconsin station who has done so much to advance the live-stock interests of that state was recently presented with a late model Franklin automobile. The purchase money was raised by subscription from people of the state who wished in some way to show their appreciation of Dr. Alexander's work. This present will greatly aid Dr. Alexander in the accomplishment of his duties because he has been of late so crippled as to necessitate walking with two canes.

The CORNELL COUNTRYMAN feels that the spirit which prompted this act is greatly to be commended. The farmers and other citizens can do much to further agricultural advancement if they will show some signs of appreciation of the noble, self-sacrificing work which the members of the staffs of the various Colleges and experiment stations are doing for the betterment of the whole nation.

Government by Polictics

In our present scheme of government all public issues are decided by the votes of political parties. There are always at least two opposing parties and a question which involves the welfare of the nation is often decided merely on a basis of party patronage. We believe this scheme is wrong.

Today a man belonging to one political party may have served the interests of the people to the fullest of his strength and ability. The administration changes and he is removed purely on the principle, "To the victors belong the spoils." Is this just to a faithful public servant and to his constituents whom he has served so well?

The time must come, and it will come just as soon as the people rise up and demand it, when questions such as Reciprocity treaties, Conservation and tariff will be adjusted impartially for the benefit of the whole people and not be simply bones of contention in political wrangles. Until then the nation is the great loser.

The rural population has long been known as a clear thinking conservative people. We urge them to take the initiative in this movement.

GENERAL AGRICULTURAL NEWS

Improving the Quality of Eggs—An active campaign for the improvement of farm eggs in the Middle West was undertaken last summer by the Bureau of Animal Industry of the United States Department of Agriculture. This work was preceded by a general survey of the field in the spring of 1908, which showed that an enormous loss was being sustained annually as the result of spoiled and deteriorated eggs. This loss results from the ignorance, carelessness, or indifference of the farmer and from the dilatory and unsatisfactory methods of marketing in vogue. The actual money loss is suffered mainly by the farmer, while the loss in quality is born by the consumer. A report of this preliminary investigation was published as circular 140 of the Bureau of Animal Industry.

The campaign of the past summer had for its ultimate end the improvement of conditions surrounding the handling and marketing of eggs, and consequently the improvement of the quality of the egg itself as it reaches the consumer. Coincident with such improvement there will be a saving to the farmer of a great part of the money loss at present sustained.

The efforts have so far been directed mainly to education in better methods, cooperation with egg buyers and State authorities, and experimentation. The actual work has been done mostly in the State of Kansas. The educational work has been done by Department field men going among the farmers and impressing upon them the necessity of keeping eggs intended for market in a cool, dry place and of marketing them frequently. Incidentally they have given the farmers help whenever possible in the practical management and breeding of poultry, and have urged the keeping of pure bred poultry.

The Bureau sought and obtained the cooperation of the egg buyers of Kansas, and as a result the "loss-off" or quality system of buying was brought into use. By this system the bad eggs are rejected and only the good eggs paid for. There is no measure which has such a definite and far-reaching influence for the improvement of the commercial egg than the general adoption of this system of buying and selling. The State food authorities also cooperated by prosecuting under existing State law cases where bad eggs were sold. On account of the material improvement effected in the Kansas eggs, the movement has spread to adjacent States, and efforts are being made to secure uniform legislation in many of these States.

In the work of investigation various lots of eggs were traced from the time they were produced on the farm until they reached the packing house, in order to determine the factors causing deterioration and to study how conditions of handling and shipment may be improved.

The results thus far have been so satisfactory that it is proposed to continue the work in Kansas in about the same manner during the coming summer.

* * *

Prize Oat Contest—Through the Iowa Corn Growers' Association, the International Harvester Company of America has offered the farmers of Iowa the largest amount of premiums ever given for the best samples of oats.

The premiums amount to $4,000, and include several of the most improved farm machines, from a disk harrow to a large shredder and also a scholarship in the Iowa State College of Agriculture at Ames. The award of prizes will take place during the ninth annual exposition and contest of the Iowa Corn Grower's Association, to be held next winter.

The policy of the association is to divide the state into classes, thus making it possible for every farmer in Iowa, regardless of the variety of

oats he is growing, to enter the contest. Also plans are made whereby each section of the state can compete within itself.

These premiums represent another step in the policy of the International Company, through its I H C Service Bureau, to encourage and assist the farmers of America in the raising of larger and better crops.

In addition to the $4,000 for oats, the Corn Growers' Association offers several thousand dollars in premiums for the best corn raised in the state. Last year these corn prizes amounted to more than $20,000.

* * *

Canadian Reciprocity—WHEREAS, The American Protective Tariff League has always advocated and now advocates a Protective Tariff which shall adequately secure all American industrial products, whether of factory or farm, against foreign competition; and,

WHEREAS, The League has an abiding faith in the wisdom of a policy which brings the factory and farm closer together; and,

WHEREAS, In our judgment, the Canadian "Reciprocity" Agreement is a gross violation of the policy of Protection in that it unfairly sacrifices the interests of American agriculture; and,

WHEREAS, The manufacturer cannot hope to retain Protection for his industry when Protection shall have been denied to the farmer; therefore, be it

Resolved, That the American Protective Tariff League is unalterably opposed to the adoption of the Canadian Tariff Agreement, and urges that all friends of Protection bring to bear every proper influence upon the Congress of the United States against the adoption of said agreement. Offered by John E. Reyburn, of Penn. Seconded by A. H. Heisey, of Ohio.

Cook Pork Well—Cases of illness sometimes occur from eating uncooked or insufficiently cooked pork which is infested with a microscopic parasite commonly known as trichina or flesh-worm, the scientific name being Trichinella spiralis. An average of 1 or 2 per cent. of the hogs slaughtered in the United States are infested with this parasite. When transmitted to human beings, trichinæ may cause serious illness, sometimes resulting in death. Out of about 15,000 cases of trichinosis recorded in medical literature, most of which occurred in Europe, 830 resulted fatally.

No method of inspection has yet been devised by which the presence or absence of trichinæ in pork can be determined with certainty, and the government meat inspection does not include meat inspection for this parasite. All persons are accordingly warned by the United States Department of Agriculture not to eat pork, or sausage containing pork, whether or not it has been inspected by federal state, or municipal authorities, until after it has been properly cooked.

A temperature of about 160 degrees Fahrenheit kills the parasite, therefore pork when properly cooked may be eaten without any danger of infection. Fresh pork should be cooked until it becomes white and is no longer red in color in all portions of the piece, at the center as well as near the surface. Dry-salt pork, pickled pork, and smoked pork previously salted or pickled, providing the curing is thorough, are practically safe so far as trichinosis is concerned, but as the thoroughness of the curing is not always certain, such meat should also be cooked before it is eaten.

A pamphlet giving information on the subject may be obtained on application to the Secretary of Agriculture, Washington, D. C.

CAMPUS NOTES

The Department of Horticulture is establishing some cooperative experiments in the rotation of vegetable crops on muck lands at several points in the western part of New York State. Mr. Paul Work has charge of the experiments.

* * *

An anonymous donor has presented the Department of Horticulture with a draft for $300 to cover the cost of printing a new edition of Bulletin 278 on the classification of the Peony.

* * *

More requests have come to the Department of Horticulture this year than ever before, for men to undertake field work in orchard and garden such as pruning and spraying. The firm of J. G. Harrison & Co. of Berlin, Md. offers to take fifty students for the summer, and give instruction in propagation work in their nursery and grounds at $1.00 per day and board.

* * *

Some cooperative experiments have been taken up by the Department of Horticulture with the National Sweet Pea Society and the American Gladiolus Society for the study of the varieties and nomenclature of these two groups of plants.

* * *

Next year's curriculum will include the new Department of Forestry under Prof. W. Mulford, and probably a Department of Rural Education which has had its beginning in the present work of Mrs. Comstock and Miss McCloskey.

In co-operation with the U. S. Dept. of Agr., the Department of Farm Crops is carrying on, in Broome County, an extensive investigation of the problem of the renewal of the run-down pastures of the State. Inasmuch as pasture lands constitute about one-third of the agricultural land of the State and in view of the fact that a large proportion of these pastures are highly inefficient, it is extremely important that the most economical methods of pasture renewal be worked out. Accordingly, four five-acre plots are being experimentally treated with the various fertilizers and with lime. Mr. M. C. Burritt, '08, is personally supervising the work in Broome County.

* * *

Those members of the class in Pomology who remained in Ithaca over Easter vacation were given a treat royal by Prof. C. S. Wilson of the Department of Pomology. Early Saturday morning about thirty members of the class railroaded to Geneva where they were met and given a straw ride to Prof. Wilson's home, a distance of about four miles. The remainder of the morning was spent in looking over the farm and accessories. At noon they were invited in to a big tempting dinner, after which a social hour was spent around the piano. A visit was then taken to the fine large orchards, which served as a splendid object lesson to the students. The class looked for the last time on the old "Indian Tree",

which has since been cut down. This famous old tree which is pictured in the "Apples of New York" was planted by the Indians before 1776. It had been grafted to two or three different varieties, and a few years ago yielded sixteen barrels of R. I. Greenings. The original Indian variety was preserved till the last on a few of the branches. It was a small, red striped apple, lacking flavor and juiciness. A hotly contested baseball game, umpired by Prof. Wilson, completed the days festivities. The best team won 14-2.

* * *

A new, well illustrated Bulletin on "The Box Packing of Apples" by Prof. C. S. Wilson, is now on the press.

* * *

About one-fourth the land at the east end of Alumni Field has been set aside for building purposes. The remainder has been divided up and will constitute experimental gardens for the Departments of Soils, Plant Physiology, Horticulture and Pomology. During the present season some will be tilled and cropped but probably the grading will not all be finished before next year.

* * *

On the University farms there are 250 acres under cropping, aside from experimental plots. The Department of Farm Crops plans to plant as follows: To oats and peas for forage, 11 acres; oats for grain, 30 acres; corn, 70 acres; and root crops, 2 acres. There will be 18 acres of alfalfa and 87 acres of timothy and mixed hay to cut.

* * *

There will be a Summer School in Agriculture at the college this summer for those teachers who expect to teach Agriculture, Home Economics or Nature-Study. It will be a six weeks' course as in the regular summer session. There will be no tuition for the Agricultural Course. Those who wish to split their courses and to take some work in the University summer school, also, may do so by paying a small tuition. The Agricultural course will include no course given in the University summer session.

* * *

The annual Rural School Picnic is being discussed for this spring and if it is held, May 26th will be the probable date.

* * *

An enthusiastic and well-attended athletic mass meeting was held in the Auditorium, Friday evening, April 14. After opening the meeting by singing Alma Mater, the audience listened to an encouraging talk by "Jack" Moakley. Mr. Moakley assured the track teams of his support and urged those who had been successful in intercollege running to come out for the Varsity. Mr. Hugh Troy, '96, next gave some valuable suggestions for the crew men and vividly described how good, hearty cheering helps the men in the boat.

C. C. Cheney, '11, then entertained the company with stories. During the evening, a quartette composed of G. W. Peck, '12, C. W. Whitney, '12, F. H. Perl, '11, and J. P. Hausle, '12, gave selections which brought forth very hearty applause. Hausle's musical stunt at the piano was also most heartily received.

Prof. J. E. Rice, who presided, presented medals to the members of the different teams as follows:

Baseball: E. C. Auchter, '12; C. E. Emmons, '12; I. B. Lipman, '12 S. A. Miller, '12; L. B. Pritchard, '12; H. B. Rogers, '12; B. C. Stark, '12; W. C. Stokoe, '12; D. D. Ward, '12; W. R. Wilson, '12.

Soccer: F. N. Darling, '11; W. C. Funk, '11; J C. Laue, '11; E. R. Waldenburger, '11; W. H. Bronson, '13; J. H. Neethling, '11; A. L. Rheingautz, '12; Harry Sonnenfeld, '12; W. I. Wilson, '12; S. C. Bishop, '13; F. P. Brown, '13; S. Q. Cheu, '13; M. B. Goff, '13; H. W. Hageman, '13; C. H. Lemon, '13.

Basketball: J. H. Rutherford, '10; G. Burt, '11; J. Retick, '11; W. G. Stephenson, '11; H. C. Wheaton, '11;

T. M. Hunt, '12; D. D. Ward, '12; E. A. Brown, '13; N. D. Steve, '13; W. E. Wilbur, '14; A. C. Wright, '14.

Track: F. H. Hahnel, '11; B. H. Austin, '12; J. C. Kraker, '12; R. Van Kleek, '12; L. D. Bragg, '13; I. S. Warner, '13.

Cross Country: W. R. Wilson, '12; J. S. Brown, '13; W. D. Haselton, '12; E. V. Hardenburg, '12; O. B. Kent, '13; N. F. Stearns, '13.

Crew: H. B. Munger, '12; H. B. Rogers, '12; L. C. Armstrong, '13; A. J. Cochrane, '13; W. H. Hook, '12; M. H. McClew, '13; E. Potts, '13 Durban Van Law, '13.

Composer of the Agricultural College yell, G. M. Butler, '12.

After the awarding of the medals, the company adjourned to the hall where apples were passed around and a social hour was enjoyed.

* * *

The first meeting of the Poultry Association under the direction of the new board was held March 29th. Incubation was the general topic of discussion, particularly the advantages and disadvantages of moisture machines. Mr. F. J. Burgdorff, Jr., read a paper on incubation in Egypt. After the meeting adjourned B. Tyson, '12, and S. H. White, '12, gave stunts. Apples were served as refreshments.

* * *

The members of the Trumansburg Poultry Association were the guests of the Cornell Poultry Association on the evening of April 12th. The visitors explained the methods of their organization and the benefits of such societies in rural communities.

* * *

A class composed of seniors and juniors in the Department of Home Economics, with Miss Rose, spent three days during the Easter vacation in Buffalo and Rochester. The class inspected a number of lunch rooms, cafetarias, factories and other points of interest making a special study of the methods and practices of the restaurants, etc. in large cities. While in Buffalo the class went through one of the large packing houses. All voted it a most profitable and enjoyable trip.

* * *

Monday evening, April 17th, was the occasion of the one hundredth meeting of the Round Up Club.

To commemorate this important point in its history the Club held a "barbecue," inviting the faculty and student body as its guests. The meeting was held in the judging pavilion. Professor Wing outlined the history and purpose of the Round Up Club and told of the many benefits which students obtain from the organization. An average of twenty-five meetings a year have been held since its organization in 1906 with an average attendance of eighteen members. The other speaker was Dean Bailey who gave a characteristically good talk bringing out some means by which animal husbandry students were to greatly aid in the development of Society. Music was furnished by a trio consisting of piano and two violins, the former played by D. E. Smith, '14 and the latter by W. A. Hutchinson, '13, and J. P. Sanderson Jr., '14.

Refreshments consisted of roast lamb, brought in directly from a wood fire in the rear of the pavillion, and roast suckling pig, supplemented with Johnny cake and milk. It was indeed a novel and memorable occasion.

* * *

William Atkins, '12, has been appointed observer in the U. S. Weather Bureau Service and is to be located at Philadelphia.

* * *

Gilbert Beader, son of Ex-Governor Beader of Pennsylvania (for many years also president of Board of Trustees of University of Pennsylvania) visited here April 17th.

* * *

H. B. Cowgill, '10, visited about the College recently.

* * *

M. C. Burritt, '08, Professor Wilson's assistant during the short course, was here on a visit recently.

FORMER STUDENTS

'09, B. S. A.—W. H. Stark has been made assistant treasurer of Stark Brothers Nurseries and Orchard Co. and is assisting in the management of the largest nursery in the West. Mr. Stark married Miss Newhall, sister of John Newhall, the football coach.

'95, B. S. A.—G. Harold Powell has accepted a position as manager of the Citrus Protective League of California. The object of the Citrus Protective League is to promote the citrus interests of the Pacific Coast for the purpose of securing larger returns. He has a three year appointment at $10,000 per year. Mr. Powell was formerly acting chief of the Bureau of Plant Industry, U. S. Department of Agriculture.

'09, P. H. D.—M. B. Cummings is now Professor of Horticulture in the University of Vermont. He has been elected Secretary of the State Horticultural Society. Prof. Cummings is married and lives at Burlington, Vt.

Sp.—E. D. Smith, spent the past year in the fruit region of Oregon and Washington. During his leave of absence, he has had much valuable experience, especially in apple-packing. He has been very successful in apple-packing contests in connection with various fruit exhibitions on the Pacific Coast.

Sp. Ag.—W. E. Haynes is planting foreman of the firm Isaac Hicks and Son, noted nurserymen and tree movers, Westbury, L. I. The junior member of the firm is Henry Hicks, '95.

'08, W. H.—W. J. Toussaint, C. A. Rowell, W. H. '04, and Paul Keenan, W. H. '09, spent the winter in Southern Georgia planting pecans. Toussaint is now running a cotton and corn farm on his own account at Albany, Ga. Rowell has been made foreman of the Texas Orange Land Development Co. at Houston, Texas, where he superintended the establishment of several hundred acres of orange and fig orchards. He planted 1,000 acres with twenty trees per acre. Keenan is now foreman on the Rialto Farm at Ulster, N. Y.

'07, Sp.—Mr. S. W. Foster has been for two seasons in charge of a substation of U. S. Bureau of Entomology at Walnut Creek, Cal. He has been especially concerned with work on orange thrips and other citrus insects. Mr. Foster is closing up this work this month, and will be located near Washington hereafter.

'07, B. S. A.—Mr. A. G. Hammar who did some special research work in the Entomology department here during the fall, has been in Los Angeles, Cal. for the past two months doing special work for the U. S. Bureau of Entomology. Mr. Hammar has now returned to Michigan where he will continue his work on the apple insects under the direction of the Bureau.

Miss Edith M. Petch, Entomologist in charge of the Maine Agricultural Experiment Station has returned to Ithaca, to complete her graduate work in the Department of Entomology. Miss Petch is the only woman Entomologist having charge of a U. S. Experiment Station in the country. Her specialty is the "aphid" or plant lice group and she is a recognized authority in this field.

'09, B. S. A.—Announcement is made of the marriage of Chester C. Neal and Miss R. Elsie Love (Swarthmore '07). Mr. and Mrs. Neal are living at 1033 Shackamaxon street, Philadelphia, Pa.

'10, B. S. A.—Frank B. Kelley is with the Jackson & Perkins Company, a wholesale nursery concern, at Newark, New York.

'10, B. S. A.—L. E. Johnson is with the Sheffield Farms-Slawson-Decker Company at Vergennes, Vt.

BOOK REVIEWS

THE COUNTRY LIFE MOVEMENT. Completing the Rural Outlook Set there has recently come from the press "The Country Life Movement in the United States," by L. H. Bailey. The Rural Outlook set comprises four volumes by the same author: The Outlook to Nature, The Nature-Study Idea, The State and The Farmer and The Country Life Movement.

In the first chapter of his latest work Professor Bailey outlines and defines the Country Life Movement, contrasting it with the "back to the land" movement. Other chapters which in their titles give hints as to the subject matter are: Some Interrelations of City and Country, The Decline in Rural Population, Community Life, The Labor Problem, County and Local Fairs, Country Life and Conservation.

In the chapter, "The Fundamental Question in American Country Life" the author states, "The fundamental need is to place effectively educated men and women into the open country. All else depends on this."

The book closes with a chapter "Personal Suggestions." Today L. H. Bailey stands at the head of those people who are truly studying country life conditions. His experience and observations make him especially fitted to outline The Country Life Movement. All students of this problem if they do not obtain the Rural Outlook Set should by all means procure and carefully study "The Country Life Movement." MacMillan Company, New York, publishers. Price $1.25 net.

THE OUTLOOK TO NATURE, by L. H. Bailey, Director of the New York State College of Agriculture, Cornell University.

In this alive and bracing book, in a new and revised edition, Dean Bailey argues the importance of contact with nature, a sympathetic attitude toward which "means greater efficiency, hopefulness and repose." He points out the relation between city and country and the development of a new system of rural schools. The book abounds in wholesome optimism and helpful suggestions. Published by Macmillan & Company, New York 195 pages; price $1.25 net.

THE PRACTICAL FLOWER GARDEN. By Helena Rutherfurd Ely.

Mrs. Ely tells in an interesting manner the results of her experiments in landscape gardening; how to raise flowers and trees from seed, and how to handle them, as well as many other plants, so as to secure the best color effects and artistic display. The work is profusely illustrated with colored and half tone plates which show the reader what wonders may be accomplished by the proper use and combination of plants. It contains much of interest and value to all interested in beautifying the home or any form of rural art.

Published by The Macmillan Co., 66 Fifth Ave., New York, $2.00 net.

REPORT OF THE COMMISSION ON COUNTRY LIFE. Sturgis & Walton Company, New York. $.75 net.

The brief Report of the Commission on Country Life was submitted to President Roosevelt two years ago (in January, 1909), and by him submitted to Congress. It was printed by Congress for its use, but it has not been available for popular distribution. The call for the Report has been widespread, and it is now published in book form to meet this demand and to aid in putting the work of the Commission widely before the public. The purpose of the Commission was to determine the present status of country life in the United States, to point out its main deficiences, and to suggest lines of action and inquiry. It could not make scientific investigations on its own account, but it proposed a number of investigations that should

be made by Congress, states and other agencies. It looked on the question not from the viewpoint of technical farming, but as to means whereby country life may be redirected, to the end that a better rural civilization may be developed. It was the first inquiry of the kind, and wholly aside from its content the Report must necessarily form one of the starting points for forthcoming rural progress along economic, social, educational and religious lines.

"A PARTIAL INDEX TO ANIMAL HUSBANDRY LITERATURE" is the title of a recent contribution to agricultural literature by C. S. Plumb, Professor of Animal Husbandry at Ohio State University and author of that almost universally used animal husbandry text book, "Types and Breeds of Farm Animals."

There is no student of animal husbandry or any one actively interested in live-stock development who has not many times wished for just such a book as "A Partial Index to Animal Husbandry Literature." Professor Plumb has made a very extended and painstaking search of the sources of animal husbandry literature and compiled them in one volume where the student can in a very short time find the references he desires.

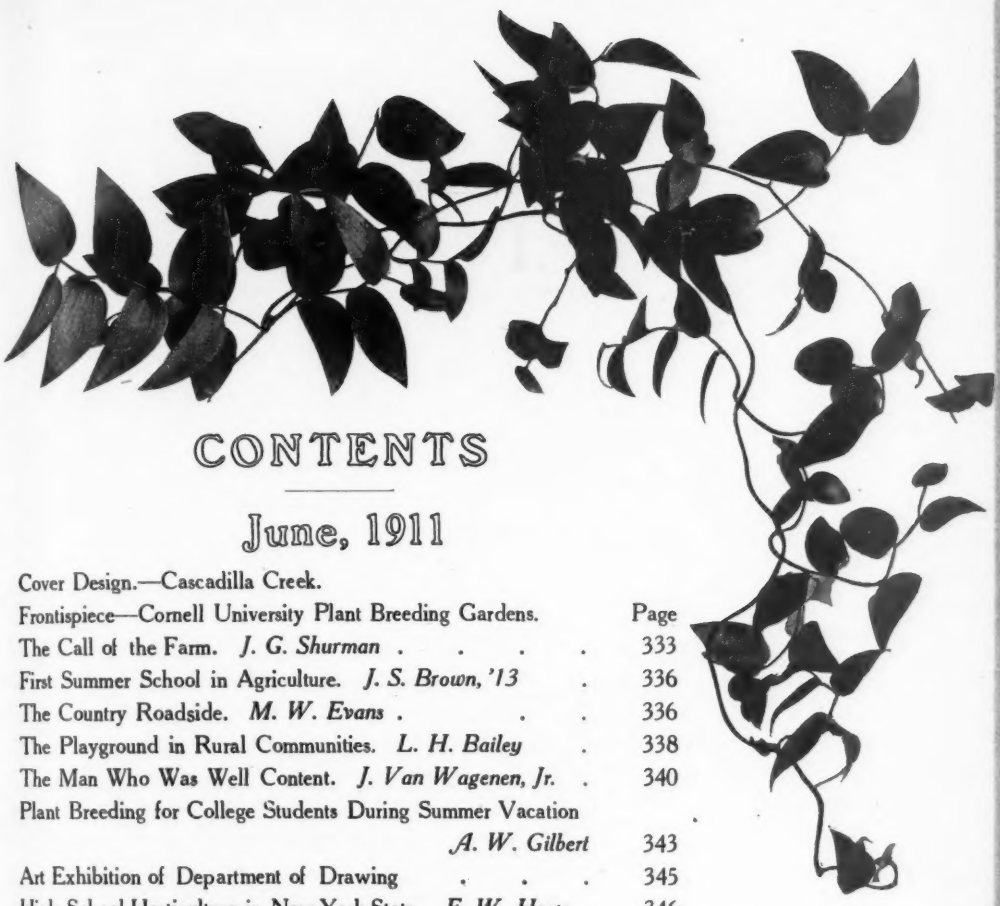
The material is very carefully indexed and arranged under headings such as: Beef Production, Breeds of Animals, Cattle, Horses, Sheep, etc. The index includes some 1240 titles of books, pamphlets, bulletins and special articles. There is an index of authors in addition to the subject index. We advise all students of animal husbandry to obtain this extremely useful book.

The volume is 6 ¼ by 9 inches and contains 94 pages. Between each pair of index pages are blank leaves to allow space for adding other titles of references. Regular price, paper covers, 60c. postpaid, cloth bound $1.00. To students in Agricultural Colleges taking ten or more copies a special price of 50c for paper covers and 80c for cloth bound copies will be made. Publisher, C. S. Plumb, Columbus, Ohio.

HOME WATERWORKS, by Carleton J. Lynde, Professor of Physics in Macdonald College, Quebec.

In this interesting and useful work, every phase of water supply and disposal is treated exhaustively, together with the reasons for many of the physical phenomena concerned in this subject. The reading matter is clear and to the point, and there are many helpful illustrations.

Published by Sturgis & Walton Company, New York; 270 pages; 106 illustrations; price $.75 net.



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